

Backus (H.)

Pathological Phenomena

GENERALIZED.

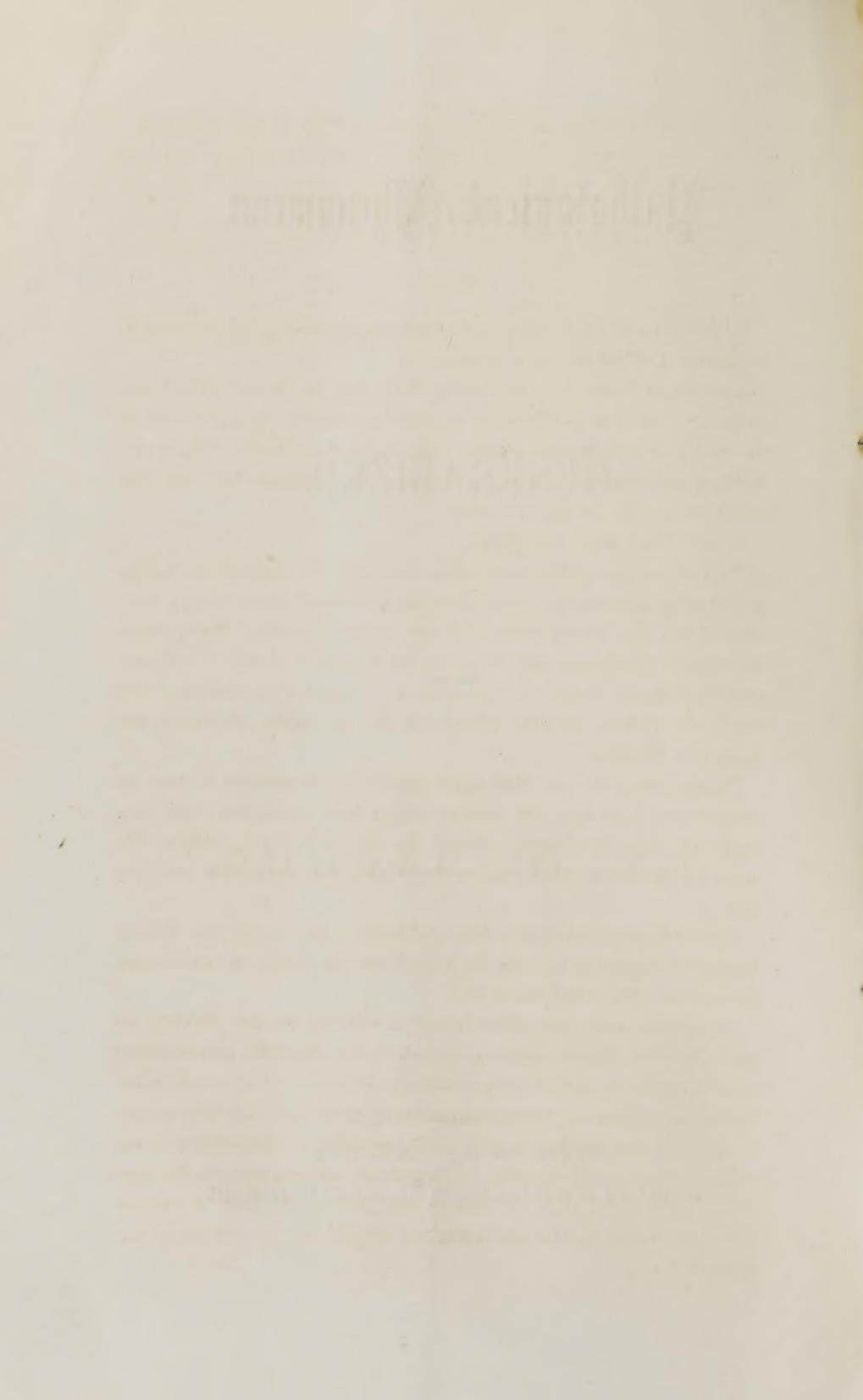
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INTRODUCTION.

To demonstrate the *point of agreement* among pathological phenomena, is the object of the following argument.

As no single individual could go but little way, by his own efforts, in a subject so complex and difficult, we must necessarily avail ourselves of the labors of others—our predecessors and cotemporaries. It is the work of generations, of ages, to construct the complex materials with which we have to do, into a Science.

Science is not made, but grows.

To develope the subject-matter then, and show the connections among pathological phenomena already attained, we must quote largely from others; and the Works from which our extracts are taken, are the common Books of reference now in use by the Medical Profession,—the common Text Books of the principal Medical Colleges in Great Britian and the United States,—and the inference is that no higher Authorities are known to Medicine.

To appreciate the scientific significance of those extracts, it must be remembered that they are generalizations from experience; and that, *combined*, they very nearly exhaust the subject in hand; while at the same time no one of their Authors wrote with reference to such combination.

Now we propose to make this combination,—to supply the links of connection necessary to bring the whole immense variety of pathological phenomena under one general Law.

Being dependent upon others for aid in working out this problem, no radically New Theory can be proposed. As a scientific generalization cannot precede the facts to be generalized, it follows that whenever pathological phenomena are successfully connected together, little that is new, or which is not *implied* in the knowledge of those acquainted with the subject-matter, can be revealed. The general Law is implied in the most simple pathological state or familiar fact, just as the Law of Gravitation is implied in the familiar fact of the Weight of bodies on the surface of the Earth.

A correct Theory cannot contradict or set aside known facts in Pathology, any more than Newton's Theory of Gravitation could contradict or set aside Kepler's Laws. The known facts are a test of the correctness of a Theory. Kepler's facts were demonstrated before the Theory of Gravitation was established, and they were a test of its correctness, since if that was correct, it must lead deductively to Kepler's Laws; and it did. Let no one reject this Theory then because it accords with the Known; since no Theory could otherwise, by possibility, be true.

Pathological Phenomena Generalized.

That Pathological phenomena have a plan as stable, conditions as fixed, and an order of occurrence as determinate as have Physical phenomena, and are therefore amenable to the same Method of investigation, few Pathologists of this age will question.

If we turn to the history of Physical Science, we see that Astronomical phenomena were once referred to supernatural causes,—Apollo and his Chariot—then to Metaphysical entities,—Numbers, Harmonies, etc—and finally, through the instrumentality of what is called the Inductive Method of investigation, were reduced to Positive Science—the Law of Gravitation.

If we look into the history of Medicine, we find that Pathological phenomena were once referred to supernatural causes,—Superintending Intelligent Principles,—then to Metaphysical Entities,—Vital forces, sympathies, &c,—and the inference is, that, through the application of the same Method which perfected Astronomy, they too are destined to be reduced to Positive Science—the Law of Gravitation.

The distinguishing characteristic of the Method alluded to is, that it proceeds with cultivated caution from the known to the unknown, and verifies its conclusions by confrontation with fact.

Of Vital forces we know nothing, and therefore can predicate nothing. We cannot reach the unknown through the unknown.

Of Pressure (which term we use as synonymous with Gravitation) we know that it can, and does produce, certain pathological phenomena; and it is through the avenues of the known that we are to reach the unknown.

That pressure will obstruct the circulation of blood, may be demonstrated by the experiment of applying a ligature

to a vein. That the pressure of blood behind the ligature will dilate the vein and produce the state marked by the term congestion, is a proposition the truth of which will be demonstrated in the same experiment. That the dilatation of the vein implies debility or a relative deficiency of power on the part of the vessel, (debility being a relative term) is a proposition the truth of which cannot be denied.

The terms obstruction, dilatation, congestion, and debility, then, are marks of each other, and marks of pressure. Accordingly, we shall see the same phenomena ascribed to each.

That pressure will produce the state marked by the term congestion with the same certainty that causes act in the inorganic world, will be demonstrated by every application of a ligature to a vein. What other phenomenon or phenomena shall appear, will depend upon the degree and duration of congestion or pressure, and this is as true of physical, as of pathological phenomena—degree and duration of force being implied in all laws of causation.

The state marked by the term congestion, then, as it is the first and easiest produced, must be the most *simple*, and therefore the most *general*. Consequently this state may exist independent of all other pathological phenomena, while all others must be compounded of congestion, degree and duration, being elements in their production. It follows :—

1st. That all exciting causes of disease produce the state marked by the term congestion.

2d. That this state precedes and co-exists with all pathological phenomena more complex than itself.

3d. That the treatment of congestion illustrates the treatment of all special diseases.

4th. That this state is a constant *post-mortem* appearance, whether there be recognised organic change or not.

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1st. All exciting causes of disease agree in producing the state marked by the term congestion.

A certain degree of pressure on the brain produces convulsion. The exciting cause may be a stick, a stone, a piece

of metal, a spicula of bone, the finger, or blood. Now it is obvious that although these exciting causes may differ in some respects from each other, those differences have nothing to do with the question, their *point of agreement* being alone concerned.

"The causes of congestion are, 1st. Those which act by primarily depressing the organic nervous influence; such as advanced age; the continued or prolonged impression of cold; mental anxiety, and all the depressing passions and moral emotions; prolonged sleep; mental and physical inactivity; miasmal, contagious, or infectious emanations; various vegetable, animal, and gaseous poisons; and the rapid loss of the natural electrical tension of the frame: 2d, Those which mechanically impede the return or circulation of the blood itself, or which change its quantity and quality, either locally or generally; as excessive heat; general plethora, produced either by too full living, or by the suppression of the natural or accustomed discharges; interrupted circulation through the heart, the lungs, liver, &c.; a long-continued posture by debilitated persons; the use of unnecessary ligatures and tight lacing; improper and unwholesome food; contamination of the blood by the absorption or introduction into it of noxious, mineral, vegetable, and animal substances, or gaseous fluids; and changes taking place in its constitution, from the interrupted secretion and elimination of hurtful matters from it: 3d, Those causes which exhaust the irritability or vital tone of the vessels, by previously exciting them above their natural state of action."—Copland's Medical Dictionary.

2. The state marked by the term congestion, precedes and co-exists with all pathological phenomena more complex than itself.

All Pathological phenomena are produced by pressure; Dilatation, and dilatation with hypertrophy of the heart, are pathological phenomena; therefore they are produced by pressure.

"Dilatation of the heart is a purely mechanical effect of

over-distention. Blood, accumulated in its cavities, exerts a pressure from the centre towards the circumference, in every direction; and when once it surmounts the resistance offered by the contractile and elastic power of the parietes, these necessarily yield and undergo dilatation." "The reader must here again be reminded that the exciting causes of dilatation are equally those of hypertrophy; and that, supposing no unknown agencies to interfere, as may sometimes possibly happen, it depends on the proportion which the cause bears to the re-acting energy of the cavity exposed to its influence, whether that cavity become affected with dilatation, with hypertrophy, or with a combination of the two."—Hope, on the Heart.

"The causes of hypertrophy and dilatation are often the same, though acting upon different principles. Whatever stimulates the muscular action of the heart may produce the former affection; whatever has a tendency to distend the walls, may produce the latter. Now no stimulus is greater, probably, to the muscular fibres than the pressure of the blood within the cavity they surround; and no cause tends more strongly than this to produce distension."—Woods Practice.

We have seen that a relatively increased pressure of blood to the returning pressure of the heart or blood-vessel, was marked by the terms dilatation, debility, congestion and obstruction. Increased action is marked by the terms re-action, inflammation, fever, and hypertrophy.

Dilatation, then, is congestion; and hypertrophy, re-action; and as dilatation and hypertrophy are produced by pressure, therefore, congestion and re-action are produced by pressure.

As dilatation with re-action or hypertrophy, and congestion with re-action or inflammation, and debility with re-action or fever, have the same antecedents or cause, and as dilatation with re-action or hypertrophy is produced by pressure, therefore, congestion with re-action or inflammation, and debility with re-action or fever, are produced by pressure also.

In looking at the condition of the heart in dilatation with

hypertrophy, then, we see the condition of the capillary in inflammation; and in looking at the condition of the System in dilatation with hypertrophy of the Heart, we obtain a full length likeness of the condition of the system in Fever.

In accordance with the foregoing we shall now see that inflammation, fever, and hypertropy, have the same antecedents or cause; and that the terms congestion, dilatation, obstruction, debility, and pressure, are used indiscriminately as marking those antecedents or cause. A multitude of other pathological phenomena will appear in the same connection, but it is to those mentioned, that we wish to direct particular attention.

"It may be said, generally, that when congestion is constant in a cavity, dilatation is more commonly the result; and that when there is only resistance to the expulsion of the blood without constant congestion of the cavity, it is more common for hypertrophy to be produced. Contraction, for instance, of the aortic orifice, causes hypertrophy of the left ventricle in a greater degree than dilatation; whereas, patescence of that orifice, attended with regurgitation and constant engorgement of the cavity, causes dilatation in a greater degree than hypertrophy."—Hope on the Heart.

"Retardation of the flow of blood in the small vessels, coincident with dilatation of their calibre and accumulation, and at last stagnation of the blood corpuscles in the vessels, constitute the first phenomena constantly appreciable by the microscope in the inflammatory process as seen in the frog. The *macroscopical* phenomena of inflammation in man, being similar to those observed in the frog, seem to warrant the inference that the *microscopical* ones also are essentially the same in him as in the frog. The explanation of these phenomena, therefore,—their sequence and relations—is justly considered the key of the whole theory of inflammation.

"That the dilatation of the small vessels is primary, and the retardation of the flow of blood in them is secondary,—the necessary physical result of the preceding dilatation—is the opinion of most recent authors." Jones' Ophthalmic Medicine, p. 50.

"The physical cause of hypertrophy, in nineteen cases out

of twenty, is some obstacle, mechanical or virtual, to the perfect accomplishment of the function of the chamber; some obstruction opposed to the free and thorough exit of the blood from it; or something which hinders the easy play of the organ: hence, in the first place, a gradual yielding, or tendency to yield, in the sides of the affected chamber, from the continued and unwonted pressure of the accumulated blood against them; and in the second place, a striving action of the muscle to overcome the hindrance, or to counterbalance the obstacle; and consequently, according to the law formerly announced, an augmentation in the bulk of the muscle whereof the function is thus increased. If the hypertrophy, which is the result of a truly conservative process, keeps pace exactly with the amount of the obstacle and exactly balances it, no dilatation happens, or next to none. But this is comparatively seldom the case. According to the principles of mechanics, a little distension of the spheroidal cavity must require an increase of force to propel from it a given quantity of blood, in the same time, through a given discharging orifice; so that incipient dilatation becomes (in addition to the supposed obstacle) an efficient cause of hypertrophy; and the two, the dilatation and the hypertrophy, commonly make progress together."—Watson's Practice, p. 661.

"If we wish to advance a step farther and tread in the regions of hypothesis, then it seems a reasonable doctrine that the primary disturbance of the functions of the nervous system acts first on the capillaries or extreme vessels of the surface, as well as throughout the internal organs, and produces, not spasm, as was imagined by Hoffman and Cullen, but rather, according to modern views of the state of capillaries in inflammation, a state of atony, relaxation, and distension, and consequently obstruction to the passage of the blood; that the disturbed state of the circulation is an effort excited by the stimulus of this obstruction for accomplishing its own removal."—General doctrines of Fever. Tweedie's Library.

"In the same way, when, from mechanical obstruction or any other cause, blood is inordinately accumulated in the

heart, the organ is provoked to extraordinary efforts; it struggles against the obstacle; it frets and labours to overcome it; the coronary arteries are excited to increased activity; augmented nutrition (hypertrophy) ensues."—Hope on the Heart.

"It is therefore evident that there are three states which always take place in fever; a state of debility, a state of cold, and a state of heat; and as these three states regularly and constantly succeed each other in the order we have mentioned them, it is presumed that they are in the series of cause and effect with respect to each other. This we hold a matter of fact, even although we should not be able to explain in what manner, or by what mechanical means, these states severally produce each other."—Cullen.

"We have stated that absolute plethora was the parent of pure inflammation. Previously to the occurrence of febrile or inflammatory action, there is always a sensible interval of disease marked by evidences of diminished power in the arterial system, the oppressed and irregular actions of which evince its inadequacy to carry on the circulation with its wonted vigor. The pulse, if examined, will be found low, oppressed, irregular; which state passes progressively into one of permanently increased action or fever. Multiplied observations have satisfied us both that the stage of disease here mentioned precedes that of fibrile action and that the morbid actions indicated by the pulse succeed each other in the order here mentioned; the first being that of feebleness or over-loaded power, the second of irregularity, and the third of permanently quickened action."—Art. Plethora, Cyclo-pedia Practical Medicine.

"The consequences and terminations of debility are (a) impeded or interrupted secretion; (b) changes of the circulating fluids; (c) various states of irritation or inflammatory action in particular organs or tissues; (d) general re-action of the vascular system associated with various grades of vital power, from the lowest or most asthenic, to its highest or most sthenic form, with their modifications; (e) changes in the firmness, elasticity, nutrition, colour, form and vital cohesion of the soft solids, and, in some instances, ultimately

in the hard solids also; (f) effusion of fluids (aqueous, serous, sanguineous, &c.,) from mucous or serous surfaces, or in cellular or parenchymatous structures; (g) the production of numerous forms of organic change; (h) the formation of new or adventitious tissues or productions, as tubercles, tumours, melanosis, cancer, hydatids, worms, gangrene, &c., and, lastly, death."—Copland's *Medical Dictionary*, Vol. 1, p. 555.

"The sequelæ of hyperæmia are multplex, varying with the *duration*, the repetition, the *degree* of congestion. Much likewise depends upon the character of the affected organ, the congestion being significant in proportion to the general importance of such organ, and the vulnerability of its texture. Organs are prone to congestion proportionately to their vascularity and to the degree of their functional activity. Under particular circumstances of life, of occupation, of civilization, certain organs, such as the brain and its membranes, and the lungs, are hardly ever entirely free from congestion. Hyperæmia affects morbid growths equally with normal formations.

"Intense congestion suddenly developed in organs essential to life (the brain or lungs) may prove fatal directly, as so called vascular apoplexy, or through the sudden effusion of blood serum into the textures—acute œdema.

"High degrees of congestion occasion laceration of capillaries and parenchymatous hemorrhage (apoplexy with bloody extravasation) in the brain, the lungs, and other organs.

"The same causes lead, by an over-loading of blood vessels, to absolute palsies of the blood vessels, to stasis, inflammation, and gangrene.

"Moderate but habitual or repeated congestion gradually engenders œdema and the dropsy of serous cavities—genuine dropsy, increased exudation of blood plasma, preternatural nutrition of the textures—hypertrophy, augmented secretion.

"In this relation, abiding mechanical congestions, from heart disease, are worthy of especial notice, with their un-failing consequences, hypertrophy of the glandular abdominal viscera; preternatural secretion of the intestinal and

bronchial mucous membranes; excessive, saturated secretion of bile.

"Hyperæmia create and bequeath permanent dilatation and elongation with coil-like or serpentine deflection—properly termed varicosity—of the blood vessel, as more particularly exemplified in the less resilient veins.

"Hyperæmia frequently occasion and obviously accompany the development of various heterologous growths. Finally, in some organs, a proportion of blood-pigment, effused with the plasma, constitutes the basis of rust-colored, slate-grey, bluish-black coloration, as in the lungs or on the intestinal mucous membrane.

"Organs attacked by a high degree of congestion present different shades of dark red, become swollen, loosened in texture, and consequently friable, lacerable." Rokitansky's Pathological Anatomy, Vol. 1.

"When a congestion is extensive it has constitutional as well as local effects. In proportion as blood accumulates in excess in a part, it leaves the rest of the body with less than its proper share, and the limbs and surface generally may show various symptoms of weak circulation and want of blood. Thus with considerable congestion of the lungs, liver, or brain, the surface is palid and chilly, the pulse weak and small, the extremities cold; there is a peculiar feeling of languor or weariness, and all the functions are indifferently performed. Such an effect on the system may be produced artificially by applying a tight bandage around both thighs at once, or even both arms in a weak person: the limbs beyond the ligature become congested, leaving a deficiency of blood in the rest of the system. The extreme of this condition is the cold fit of an ague, in which extensive internal congestions are the most essential pathological change.

"As in this example, so with other extensive congestions, more especially if suddenly induced, as by cold, a re-action may ensue, causing quickened pulse and circulation, hot skin, and other phenomena of fever. When this re-action is vigorous it may fulfil its object in sweeping back the congested blood into the circulation, and thus restoring the bal-

ance. When the re-action is weak, it will fail to remove the congestion, but constitutes a low feverish excitement, often remittent in type, with depraved functions, foul tongue, impaired excretions, restless nights, &c., which may proceed for an indefinite period, until a critical evacuation by sweat, urine, or diarrhea terminates it, and with it sometimes the congestion which has induced it."—Williams' Principles of Medicine.

"I say the blood may undergo important alterations in its quantity. It may exist in too great abundance throughout the body; and it may exist in too great abundance in certain parts only of the body. These states have been recognized for ages. Sometimes they are called respectively general and partial *plethora*: Sometimes general and local *congestions* of blood; people speak also of irregular *determinations* of blood to different organs; and, of late, the term, *hyperæmia*, first invented by M. Andral, in France, has been imported into this country, and much adopted here. All these words and phrases mean, in truth, the same thing; and their frequent recurrence in medical works, is, of itself, sufficient evidence of the frequency and importance of the conditions which they express.

"If we comprehend rightly this subject of *plethora* or *congestion*, we shall be prepared to understand some most important morbid states, of which it seems to be in many, if not in all cases, the earliest approach—the initial step. Inflammation, hemorrhage, dropsy, all acknowledge and imply a previous condition of *congestion*."—Watson's Practice, p. 41.

"In the present lecture I propose sketching for you the chief changes which occur in inflammatory effusions; those changes at least which lead to suppuration, or to chronic thickening in organs.

"I must begin by carrying you back to the subject of my last lecture, and by reminding you of what occurs when the capillary blood-vessels are overloaded with blood. I stated to you that, under these circumstances, the capillaries suffer a certain proportion of their fluid contents to exude. I stated likewise that they changed this fluid as it exudes:

and that the change thus accomplished (which distinguishes the serous fluid in question from the plasma of the blood) will vary, according as the pressure which drives it through is little or much above the healthy and normal pressure of the circulation. If the pressure be very slightly in excess, the material which transudes is a weaker solution of the salts of the blood with a trace of albumen ; as the pressure increases, the proportion of albumen becomes larger ; at length fibrin is found, perhaps only in flakes ; a stage further, and it becomes sufficiently plentiful to impart to the transuded material the property of spontaneous coagulation ; and finally the pressure may be such as to cause the rupture of the capillary vessels, and impart to the effusion a more or less considerable admixture of blood-corpuscles.

"These various degrees are well illustrated in the pathological history of the kidney. If you have hyperæmia of that organ induced, either by interference with its escaping blood, or by too much impulse in that which goes to it, an increased exhalation occurs into the urinary tubules, and you get the symptom called albuminuria—one precisely analogous in its method of production to that of ordinary serous effusion in the cellular tissue of the body. If the disease advance, the malpighian tufts pour out not only serum, but fibrin ; and in this stage, if you examine the urine microscopically, you find this fibrin in the shape of little threads: these are accurate casts of the minute urinary tubules into which the fibrin was originally poured, and from which it often brings down, entangled in its substance, a certain quantity of the cell-growth of the tubule, the epithelium or endothelium. Finally, go a stage further, and instead of seeing these little threads transparent, colourless, and of pure fibrin, you see a quantity of blood-corpuscles entangled in them ; the capillaries of the malpighian tufts having broken with the pressure, and have let all the elements of their blood escape ; so that, instead of getting a mere fibrinous mould of the microscopical tubule, you get its little mould made of a thread of coagulated blood. These changes exactly illustrate the history of congestive and inflammatory effusions in all organs of the body : and as the

kidney is peculiarly liable to such diseases—diseases, moreover, which are of the utmost interest and importance, you can hardly select a more convenient organ for exhibiting the changes in question.”—Simon’s General Pathology, pp. 78-9.

“A ligature drawn round any part of the body, so as to intercept the communication of the great vessels and the heart, may cause that part to perish. But the effect of the ligature is not the same in all cases; and it does not always produce mortification in the same way. You apply a bandage round the arm before you bleed a patient, to make the veins of the fore arm become distended, the object being merely to stop the circulation in the superficial veins. If you take it off at the end of a few minutes, the hand is at once just as it was before the ligature was applied. If you were to leave it on for twelve hours, the whole hand and forearm would become swollen; and would remain swollen for some time after the bandage was removed. The swelling in such a case arises from the congested state of the veins, and from the consequent effusion of some of the serum of the blood into the cellular membrane. If the ligature round the arm be still tighter, so as to obstruct the circulation to a greater extent, but without arresting it altogether, the same effect is produced, namely, serous effusion, which may continue for some time after the cause which produced it is taken away. The first effect, then, of a ligature which obstructs the circulation without arresting it completely, is to produce serous infiltration of the cellular membrane, and œdematosus swelling. The different kinds of dropsy depend on the same principle. Disease of the heart, impeding the circulation through it, gives rise to anasarca of the legs, and dropsy of the pericardium and pleura. Disease of the liver produces dropsy of the peritoneum.

“But let us suppose that a ligature is applied in this manner around the arm, and allowed to remain, so that the impediment *continues*. A low sort of inflammation is set up, the œdematosus swelling and tension are aggravated, and this may terminate in mortification.”

“Parts may be killed by pressure. The mode of death

here is nearly the same as when parts are killed by ligature. The difference being simply this: the pressure is like a ligature applied to a broad surface, operating not on the arterial and venous trunks, but on all the small vessels and capillaries."

"But in the great number of cases where mortification is the result of pressure, it does not occur immediately, but after the lapse of some time; and it is not a direct but a secondary consequence of the pressure. A man, for instance, is bed-ridden; he lies on a hard mattress; he becomes very thin; the skin over the os sacrum becomes tender to the touch; it inflames, assuming a dark red colour; vesications form upon it; the inflammation goes on, and ends in mortification. Hence, though pressure may produce immediate mortification in some instances, yet in ordinary cases it does so by causing inflammation first, which inflammation, the pressure being continued, ends in the same manner."—*Brodies' Lectures on Surgery.*

"Now, what I have just stated is the distinction between hypertrophy and inflammation; their general pathology has much in common—their causes are often alike—their modes of production *identical*."—*Simon's General Pathology.*

To appreciate the scientific value of the preceding quotations it must be borne in mind that they are generalizations from experience. We gather from them, 1st, that all exciting causes of disease agree in producing the state marked by the term congestion; 2d, that the same phenomena are ascribed to obstruction, dilatation, debility and congestion, thus connecting these terms together.—Indeed, there cannot be congestion without dilatation, and there cannot be dilatation without relative obstruction; and dilatation itself implies debility or a relative deficiency of pressure on the part of the vessels; 3d, that congestion is common to flux, hemorrhage, dropsy, inflammation, fever, hypertrophy, etc. This goes far to establish the general proposition that all pathological phenomena are produced by pressure.

As dilatation with hypertrophy, corresponds to inflammation, their *comparison* may reconcile the conflicting theories held with respect to the latter.

"Theories of inflammation:—Two opposite opinions have of late divided pathologists. Both parties admit that the capillaries are *dilated*, and contain a *larger amount of blood* than in health; but they differ widely as to the state of action in the capillaries. By one party it is maintained that these vessels are in a state of *increased action*, at least in the early stage of the inflammation, and that the phenomena are the direct result of an excessive exercise of the vital properties of the part affected; by the other, that they are in a condition of *debility*, at least in relation to the larger vessels from which they are derived, and that their expansion is the result of a loss of balance between the resisting force of the capillaries and the *vis a tergo*."—Wood's Practice, Vol. 1 p. 42.

Now as dilatation corresponds to debility, and hypertrophy, to increased action, the true theory of inflammation would seem to be compounded of the extremes set forth in the above extract.

"Excess of blood in a part, with motion partly diminished, partly increased—inflammation."—Williams' Principles.—

That is, dilatation with hypertrophy; the action being diminished by the dilatation, and increased by the hypertrophy.

It must not be overlooked that however much parties differ in their interpretation of the phenomena of inflammation, they *agree* as to the fact of the *presence of congestion*. This is the important point. It is the *point of agreement* among pathological phenomena that we are in search of.

Dilatation corresponds, also, to what are called *passive* diseases; and hypertrophy, to what are called *active* diseases; and as dilatation and hypertrophy are produced by pressure, therefore, passive and active diseases are produced by pressure also.

"*Active* dropsies are sometimes spoken of as belonging to the *left* side of the heart; *passive* dropsies to the *right*. What connects all these forms of dropsy is a *preternatural fulness*, in some part, or the whole, of the hydraulic machine. And this seems to be the grand key to the entire pathology, as well as to the remedial management of the disease."—Watson's Practice.

What puts the question of the connection of the states called passive and active, or debility and increased action, beyond controversy, is the fact that they are *relative* states, and, therefore, produced by the same cause.

The diseases of the nervous system will now come under consideration, and it will appear that they, too, are produced by congestion, pressure—that congestion is common to all.

"Congestive disorders of the nervous system." I have previously pointed out the peculiar nature of the circulation within the cranium and vertebral canal, and shown that, although well defended under ordinary circumstances against any mischievous change, still when such change does occur it operates in a peculiar manner. In other words, as long as the bones are capable of resisting atmospheric pressure, although the amount of fluid within these cavities cannot change as a whole, yet the distribution of that amount may vary infinitely. Thus by its being accumulated sometimes in the arteries, at other times in the veins, or now in one place, and then in another, unaccustomed pressure may be exercised on different parts of the nervous centres. This according to its amount may either irritate or suspend the functions of the parts, a fact proved by direct experiment, as well as by innumerable instances, where depression of bone has caused nervous phenomena, which have disappeared on removal of the exciting cause. That congestion does frequently occur in the brain and spinal cord, there can be no doubt, although it cannot always be demonstrated after death. The tonic contraction of the arteries is alone sufficient to empty them of their contents, and turgidity of the veins may or may not remain according to the symptoms immediately preceding death, and the position in which the body is placed. But it is observable that every cause which excites or diminishes the action of the heart and general powers of the body, are at the same time those which induce nervous disturbance, as well as occasion a change of circulation in the cerebro-spinal centres—such as the emotions and passions, plethora, and anemia, unaccustomed stimuli, uterine derangement, etc., etc.

"It is only by this theory that we can understand how

such various results occasionally occur from apparently the same cause, and again how what appear to be different causes produce similar effects. Thus violent anger, or an unaccustomed stimulus may, in a healthy person, induce a flushed countenance, increased action of the heart, a bounding pulse, and sudden loss of consciousness. Again, fear or exhaustion may occasion a palid face, depressed or scarcely perceptible hearts action, feeble pulse, and also loss of consciousness. In the first case, or *coma*, there is an accumulation of blood in the arteries and arterial capillaries, and a corresponding compression of the veins; in the second case, or *syncope*, there is distension of the veins and venous capillaries, with proportionate diminution of the calibre of the arteries. In either case, owing to the peculiarity of the circulation within the cranium, pressure is exerted on the brain. Hence syncope differs from coma only in the extreme feebleness of the hearts action, the cause, producing loss of consciousness, sensation, and voluntary motion, being the same in both. Indeed it is sometimes difficult to distinguish these states from each other, and that they have frequently been confounded does not admit of doubt.

"In the same manner, partial congestions from either cause may occur in one hemisphere, or part of a hemisphere, in the brain, or in any particular portion or segment of the spinal cord. The pressure so occasioned may irritate and excite function, or may paralyze or suspend it; nay, it may so operate as to suspend the function of one part of the nervous system, while it exalts that of another. Thus all the phenomena of epilepsy are eminently congestive, the individual frequently enjoying the most perfect health in the intervals of the attack, although the effects are for the time terrible, causing such pressure that, while the cerebral functions are for a time annihilated, the spinal ones are violently excited. In the same manner are explained all the varied phenomena of hysteria and spinal irritation, for inasmuch as the spinal cord furnishes, directly or indirectly, nerves to every organ of the body, so congestion of this or that portion of it may increase, pervert, or diminish the functions of the nerves it gives off, and the organs which

they supply. Congestion, therefore, we conceive to be the chief cause of functional nervous disorders originating in the great cerebro-spinal centre.”—Bennett’s Clinical Lectures on Medicine, pp. 403-5.

“The cases which have been just now reported, have shown the principal forms symptomatic of hyperæmia of the cerebral hemispheres. On combining with those few cases which ended in death, several others of the same kind which terminated favourably, we have been led to the inference, that cerebral congestion may present itself to us in one of the eight following forms:—

“The first form is characterised principally by dizziness of greater or less intensity: the patients may be affected at the same time with pain of the head, dizziness, *tinnitus aurium*, momentary aberrations of vision, temporary embarrassment in speech, a sense of formication in the limbs, and sometimes at the face. The countenance is generally flushed, eyes injected, pulse in general not frequent, and of variable strength. This state may last but for some moments, or some hours; but it may also be prolonged for several months, nay, continue even for several years. In some persons it shows itself but once; in others it reappears at intervals more or less remote. We have seen a man fifty-nine years of age, who, for the last thirty years, had not passed a single day without having in different degrees one or other of the symptoms mentioned in the preceding paragraph. Another person had experienced them from the age of thirty years till he was thirty-four. He then became completely freed from it till the age of forty-eight, at which time he was again attacked with violent dizziness. We noticed the case of several persons in whom every year, nearly in the same month, these attacks of dizziness reappeared. In some females they manifest themselves regularly at the return of each menstrual period.

“After this dizziness has lasted a shorter or longer time, it may happen that they attain all at once such an intensity as to be changed into a sudden loss of consciousness; but the latter may likewise supervene without having been preceded by dizziness. It is this sudden loss of consciousness, with

or without preceding dizziness, which characterises the second form of cerebral congestion. In this form the patients fall to the ground, deprived suddenly of all understanding, sensation, and motion; but if their limbs be raised, they do not fall back again by their own weight, and some patients can sustain them in the air. There is not then, properly speaking, any paralysis. They may remain in this state from some minutes up to twenty-four or thirty hours: then they come to themselves, and are quickly restored, without any lesion either of sensation or motion remaining. Others, after having come to themselves, retain for some days a little difficulty in the performance of some of the functions of the life of relation. Thus their speech is embarrassed, or their different movements are difficult.

"At the same time that the patients fall deprived of consciousness, they may be struck with paralysis, either general, or confined to only one side of the body. This is the third form of cerebral congestion. But almost at the same time that the loss of consciousness disappears, the paralysis is also seen to disappear, so that cerebral hemorrhage cannot be admitted to have taken place in this case. The cases we have cited prove the possibility of this paralysis, without any effusion of blood having taken place into the brain. Instead of general or partial suspension of motion, this function may be performed in a manner disorderly and irregular, and without any participation of the will. Then at the same time that there is loss of consciousness, there are observed, either different convulsive movements or permanent contraction of a certain number of muscles; all these symptoms last at the utmost for some hours, they then disappear, without leaving any trace behind. This constitutes the fourth form of cerebral congestion. In a fifth form, there is no longer loss of consciousness; it is paralysis that comes on at the very first, sometimes limited to certain muscles of the face, sometimes extend to the entire of one side of the body. This paralysis disappears very promptly, oftentimes a few hours after having commenced; and from this circumstance it is not to be presumed that it is connected with a hemorrhage, or softening. Our fourth case actually proves the

contrary. The course of this paralysis was very remarkable in the following case. A middle-aged man working in the quarries near Paris, was suddenly seized, on finishing his dinner, with numbness of the right hand ; an hour after, the entire upper extremity was totally deprived of motion ; no pain is felt in it, nor does he complain of his head. At five o'clock in the evening, he had a sense of formication in the right foot : soon the power of motion was equally lost in the lower extremity of the right side : he entered the hospital *Cochin*. On the following morning the hemiplegia of the right side was complete ; the sensibility of the paralysed limbs was still retained ; he cannot move the right cheek, and when he speaks, the left commissure of the lips is drawn up ; the direction of the tongue is straight, intellect perfect ; he feels a numbness (this is his own expression) towards the frontal region ; he was bled to sixteen ounces. In the course of the day he was able to make some slight motion with the extremities of the right side. On the following morning there was no trace of paralysis. This certainly is not the way in which the effects of cerebral hemorrhage disappear, or of any lesion affecting the interior of the nervous mass.

"The sixth form of cerebral congestion is characterised by the sudden appearance of convulsive movements, partial or general, without preceding loss of consciousness. These movements promptly disappear, without leaving any trace behind them. They may also come on, after the persons have experienced attacks of giddiness for a shorter or longer time, and the latter may even survive them. In a seventh form, the cerebral congestion no longer produces coma ; it no longer exercises any perceptible influence on the movements ; the intellect is the function here especially disturbed ; violent delirium is observed, accompanied with great development of muscular strength ; most frequently, some time before death, the delirium is replaced by a state of coma, which becomes more and more profound. However, we have ourselves seen cases in which, up to the moment of death, the patients retained great agitation of the limbs, and ceased not to speak and vociferate. The most remarkable case of this kind which we met was that of a middle-aged

man, who for several hours uttered incessantly cries so loud as to disturb the rest of the entire ward. Suddenly he was no longer heard ; when we approached his bed he was dead. A thunderbolt could not have struck him more promptly.

"On opening the body no other lesion was detected except considerable injection of the nervous mass. We shall now notice the eighth form of cerebral congestion, of which our fifth case presents us an example. In this form we see continued fever appear at the commencement, during which those symptoms principally predominate, which appertain to the first form of cerebral congestion already described. We particularly observed this form in some young soldiers, who were admitted in considerable numbers into our wards at La Pitie, in the beginning of the summer 1831. After laborious exercise, several of these soldiers were seized with violent pains of head, vertigo, ringing of the ears ; some even fell suddenly deprived of consciousness, and on coming to themselves they remained with the symptoms above detailed. On entering our wards, a little time after the attack of their malady, they presented to us the following state :—Face red ; eyes injected and moistened with tears ; ringing of the ears, vertigo ; great dizziness, which prevented them from standing erect without being threatened with falling ; frequent epistaxis ; general debility ; continual tendency to sleep ; pulse strong and frequent ; skin hot ; no appreciable alteration with respect to the digestive or respiratory organs. This group of symptoms lasted from between three to twelve days ; almost all of them were bled ; some were merely subjected to the use of diluent drinks. By degrees the fever lessened, according as the symptoms of cerebral congestion disappeared. No doubt it was not demonstrated that all the diseases in these cases was in the brain ; perhaps there existed only mere general over-excitement, in which this organ participated. But the prevailing symptoms were always those of cerebral congestion, and, on the removal of the fever, these were the only symptoms observed, and the only therapeutic indication was to combat them. None of these cases terminated fatally : in one patient only there was momentary delirium ; in others the attacks of dizziness were

for some days so violent, that we dreaded lest they should terminate in apoplexy."—Andral's Medical Clinic.

" Neuralgia is so intimately related to palsy and apoplexy as to entitle it to have been viewed as the not infrequent antecedent and concomitant of these maladies, and to have been considered as one of their most important complications. But it is equally allied with other maladies, as with epilepsy, coma, and convulsions; and it, in common with those and with the several states of palsy and apoplexy, depends upon a variety of organic lesions of the brain, or of its envelopes, or of the spinal cord and its membranes, which lesions, according to their seat, grade, and nature, occasion either of these maladies—the same lesion even, according to its seat and developement, producing either or even all of them in succession, and after indefinite periods, or even intervals or intermissions. A tubercle or tumour of any kind, for instance, may first occasion neuralgia or epilepsy, or neuralgia following epilepsy, or convulsions, and successively partial palsy, hemiplegia, and ultimately apoplexy, or profound coma, or asphyxia."—Copland on Palsy and Apoplexy.

" There is a manifest connection between hysteria, catalepsy, epilepsy, palsy, and apoplexy. * * Although the phenomena of these diseases are so different as to render them nosologically distinct, yet they all, with the addition of chorea, convulsions, and even insanity, comprising puerperal mania and convulsions, present a more or less intimate pathological relation, in respect both of their physiological pathology and of their organic changes."—Ibid, p. 186.

" Apoplexy, long as this term has been familiar to the profession, still conveys a very indefinite meaning. Some authors use it to distinguish a particular class of symptoms and effects of disease; others to distinguish the pathological condition which gives rise to the symptoms. I think that it is applied too generally to the effects of disease, instead of the cause. The classification of diseases of the brain which I have adopted is founded on pathology, not on symptomatology. I propose using it to designate pressure on the brain or encephalon, produced by extravasation of blood or serum, or by

distention of the vessels without extravasation, such extravasation not being the result of violence, as a blow upon the head. Wherever I employ the term apoplexy, I use it as synonymous with cerebral pressure, and I believe that all its varieties depend on the amount of the effusion and the part of encephalon injured."

"In many cases it is extremely difficult to distinguish apoplexy from congestion, and epilepsy at the period of attack. Dr. Bright remarks on the difficulty of drawing a correct diagnosis between apoplexy from congestion and certain epileptic attacks. There is in truth scarcely any precise distinction to be recognised; the same state of vessels apparently inducing both, and the one passing imperceptibly into the other. The convulsive nature of the symptoms marks the chief difference, and this probably depends rather on some original irritability of brain, or on the part which chiefly suffers from congestion, than on difference of the exciting cause."—Solly on the Brain.

"I confess that the difficulty is not wholly relieved by these considerations. But it is a difficulty which cannot invalidate the evidence of numerous facts that attest the agency of pressure, as, at least, one cause of coma. The presumption of agency arises whenever coma immediately succeeds to pressure; and it is converted into certainty if, upon the removal of pressure, the coma immediately departs. *Now the annals of physic are full of instances of this kind.* In experiments upon animals, stupor has been brought on, and made to cease, at the pleasure of the operator, by applying pressure to the exposed brain, and by remitting that pressure. Nay the experiment has been tried on the human brain itself. A man who had undergone the operation of trepanning, and had recovered, was in the habit of exhibiting himself for money in Paris, where Haller saw him. He suffered the spectators to make pressure upon his brain, where it was covered by integuments only. This always put him into a state of coma or deep sleep; but sensibility and the power of voluntary motion returned at once when the pressure was taken off."—Watson's Practice, p. 310.

"The effects of pressure have often been observed by ex-

periments on animals. If the cranium of a dog is trepanned and pressure performed on the *dura mater* to a *certain extent*, the animal shows signs of great uneasiness, and is affected with general convulsions; if the pressure is *increased*, the convulsions cease, the breathing becomes stertorous, the animal torpid and comatose; if the pressure is *diminished*, the breathing becomes free and the convulsions return; and if it is entirely *removed*, the animal soon completely recovers. The principal causes of pressure are congestion, effusion, etc."—*Cyclopaedia Pract. Medicine.*

"In one rabbit I tied the jugular veins on each side of the neck. When it was at liberty, it ran about, cleaned its face with its paws, and took green food.

"Its respiration was reduced to sixty-eight inspirations in a minute, which is about half the natural number. After four hours it ran about as if nothing had happened, and eventually recovered.

"When it was killed and injected, I found, on each side, three anastomosing veins, passing from the anterior to the posterior part of the jugular veins, and conveying the blood from the head to the heart; but the vertebral vein had remained whole, and become enlarged; and it passed on the fore-part of the vertebra, from the head to the space between the fourth and fifth cervical vertebra, where it entered the vertebral canal.

"In a second rabbit, I tied the jugular veins on each side of the neck as before. The animal's respiration became slow, but it ate green food, ran about and was difficult to catch; but for five days after it appeared dull; its ears had dropped. On the seventh day it was seen to be convulsed, and frequently rolled over. Its voluntary powers were lost, as well as its sensation, in a great degree. On this day it died. On examination a clot of blood was found extravasated in the left ventricle of the brain. Hence it follows that apoplexy will occasionally result from an obstruction to the return of blood in the jugular veins; and this I have known to happen from enlargement of the glands in the neck of a boy."—*Sir Astley Cooper's Experiments.*

"The fact, then, which is beyond dispute, of the frequent

pre-existence of local engorgement and distention of the capillary circulation, gives support to the hypothesis that, (in certain cases at least), the issue of blood results from pressure, whereby the blood in substance is urged through passages naturally impermeable by its red particles, but now mechanically dilated by the *vis-a-tergo*. Although the dilatation cannot be made sensible to the eye, this seems the simplest and most obvious explanation applicable to some forms of idiopathic hemorrhage, and to the secondary species of that which is symptomatic. That blood may be thus exhaled, independently of any disease of the vessels themselves, we know from experiments made on animals, and from the observation of what sometimes occurs in the healthy human body. Boerhaave produced hemorrhage into the intestinal canal of a living dog by placing a ligature on the vena porta. An extreme turgescence of the whole venous system is one of the results of sudden strangulation. Dr. Yolloy accordingly found such turgescence conspicuous in the bodies of five criminals who had recently suffered death by hanging; and in two of these instances, blood in considerable quantity had exuded from, and coagulated upon, the mucous membrane of the stomach."—Watson.

"The adequacy of venous obstruction to produce dropsy, is well illustrated by some experiments of Lower. He tied the jugular veins of a dog, expecting the animal to die of apoplexy; instead of this result, the face and head of the animal became much swelled with oedema. He then tied the ascending cava; ascites and anasarca of the lower extremities were the result. Disease affords numerous examples of dropsy and flux from venous obstruction."—Williams' Principles.

We have now passed in review the great majority of what are called special diseases, and it has appeared that the simple state marked by the term congestion, was common to all.

Additional attention will now be directed to that complex constitutional state known as Fever.

As the state of the system in dilatation with hypertrophy of the heart corresponds to the state of the system in fever,

we may, by comparison, clear up the doubts and difficulties which have so long environed the latter. It is the province of a correct Theory to clear up doubtful questions.

We will now compare Ague and Fever with Dilatation and Hypertrophy of the Heart; and this comparison will illustrate the pathology of the former. Being *parallel* in all essential respects, their phenomena must be the same.

We have already seen that congestion precedes and co-exists, with each. In dilatation, we have the feeble pulse, the pale or lived complexion, the cool or cold surface, and all the passive phenomena of Ague.

In hypertrophy, we have the strong pulse, the flushed surface, the relatively increased heat of skin, and all the active phenomena of Fever.

Sometimes fever does not supervene upon ague. Sometimes hypertrophy does not supervene upon dilatation.

Their varieties correspond. If dilatation predominates over hypertrophy, we have the low, asthenic, varieties. If hypertrophy predominates, we have the active, sthenic, forms. As differences in *duration* are not differences in *kind*, we may exclude them.

In dilatation of the heart, which corresponds to ague, and in dilatation with hypertrophy, which corresponds to fever, there is venous congestion; and as there are no valves in the internal system of veins, including those of the head and spine, this venous congestion or increased retrograde pressure of venous blood, may extend to the organs of the abdomen, thorax, and head, thus furnishing an appreciable cause for the multitude of phenomena, as flux, hemorrhage, vomiting, dyspnea, pain, stupor, delirium, convulsions, etc., etc., which sometimes attend these affections.

Venous congestion, is common to ague, dilatation, fever, and hypertrophy.

"During the cold stage the blood seems to be largely accumulated in the veins of the viscera generally, and very much so in those of the portal system, so that we find the functions of the alimentary canal and the liver disturbed early in the disease; and merely by its long continuance, even should its general character be devoid of all malignancy, serious organic affections are occasionally produced. That

the accumulation of blood in the viscera during the cold stage is considerably instrumental in engendering them, is shown not only by general reasoning of a very obvious nature, but by the fact that these morbid affections arise more frequently in the quartan, which has the longest cold stage, than in the other forms of intermittent. * * To this cause, the remora of blood in the veins of the viscera during the cold stage, is superadded the arterial congestion of the same organs during the stage of excitement."—Art. Intermittent Fever, Cyclopaedia Practical Medicine.

"And if the local inflammation, which can be ascertained to take place during fever, is inadequate to explain the characteristic typhoid symptoms, it is equally in vain to seek an explanation of these symptoms, as some have done, in the mere circumstances of irregular distribution and congestion of blood.

"Even the peculiarities of that form of fever which has been described under the name of congestive, are not to be explained by the mere circumstances of internal congestion the existence of which, in the vessels, and especially in the veins of internal parts, in these circumstances, is admitted. For although congestion or stagnation of blood within the cranium may be held to be a sufficient cause of stupor, yet we are so far from regarding congestion in the great veins leading to the heart as a sufficient cause for deficient action there, and consequent feeble pulse and cold skin, that we have already stated the accumulation of blood in the great veins to be apparently the chief cause of the increased action of the heart, or the re-action, in the more usual form of fever."—Alison's Outlines of Pathology.

"In the preceding section I have shown that the effect of dilatation is, to enfeeble the heart, and thereby occasion the phenomena of an *obstructed* circulation. We have now to examine those phenomena as signs of dilatation.

"**GENERAL SIGNS.**—The heart, when weakened by dilatation, is subject to palpitations of a feeble, oppressed kind, and more or less distressing, frequent and prolonged, according to the extent of the malady. The attacks are provoked by any over-exertion or mental excitement.

"The pulse is soft and feeble, and if the debility of the heart be very considerable, it is small. Irregularity and intermittence are rare, except during protracted and distressing paroxysms of dyspnoea, or when the vital powers are much exhausted, as in the advanced stage of the disease.

"The languor of the arterial circulation in dilatation causes the extremities and surface to be chilly, the disposition to be melancholy, and the character to be deficient in energy.

"The blood not being freely transmitted by the left ventricle, accumulates in the lungs by retardation: whence difficulty of respiration; cough, sooner or later attended, in many cases, with copious expectoration of thin serous mucus; œdema of the cellular tissue of the lungs greatly aggravating the dyspnoea; terrific dreams with starting from sleep; and passive pulmonary hemorrhage of dark, grumous blood in small quantities, forming sanious sputa, and generally the precursor of death in individuals affected with great difficulty of respiration. After death, I have found this hemorrhage connected with pulmonary apoplexy, and always with great engorgement.

"The lungs being obstructed, the engorgement is propagated backward to the right side of the heart, to the great veins, and finally to all their ramifications. From this venous engorgement arises a series of striking phenomena, which we shall review successively, premising that the hemorrhage and dropsy do not generally come on till a late stage of the disease.

"1. Serous infiltration.—This generally makes its appearance first in the lower extremities, because it is in them that the circulation is most languid, the return of blood being opposed by its gravity, while it is little promoted by the action of superincumbent muscles. The œdema gradually ascends, and, under the name of anasarca, may eventually attain the utmost degree over the whole surface of the body. Increased serous exhalation takes place from the serous membranes also, whence hydrothorax, hydro-pericardium, and ascites: one or other of which is almost invariably present when there is much external dropsy.

“2. Discoloration of the face.—If the complexion was originally florid, it becomes purple or deep violet, on the centre of the cheeks, the end of the nose, and the lips, with intumescence of the latter, while the intermediate parts are pallid and sallow. If originally pale, it becomes cadaverously ex-sanguine, and has a dusky, leaden or venous cast, especially around the eyes. The lips are either livid or very pale. Lividly sometimes shows itself in the extremities as well as in the face.

“3. Congestion of the brain.—This produces the usual symptoms of passive cerebral congestion, and of the corresponding form of apoplexy; namely, dull headache, felt principally along the course of the great sinuses; hebetude of the mental faculties; stupor, convulsions, and eventually complete coma. It is not unusual for these symptoms to supervene a few days before the fatal termination. Sometimes they depend, not on congestion alone, but partly on serous effusion into the ventricles, or on the surface, resulting from the congestion; sometimes, again, the congestion ends in sanguineous apoplexy, of which I have seen several instances. Whence it is incorrect to suppose that this catastrophe is peculiar to hypertrophy of the heart.

“4. Injection of the mucus membranes.—It is common to find them after death so vascular as to present the appearance of inflammation. This is especially the case in the stomach and intestines, and it is necessary to be aware of the circumstance, in order to guard against the error of attributing the redness to inflammation.

“5. Passive hemorrhage.—This takes place from the lungs, as already stated, also from the nose, the stomach, the intestines, the uterus, and more rarely from the bladder. It results from engorgement of the mucus membranes. The effusion consists of dark blood exuding in small quantities. When from the stomach, and not immediately ejected, it has occasionally the appearance of coffee grounds, in consequence of being exposed to the coagulating action of the gastric juice. In the intestines it is often blackened by the intestinal acids.

“6. Congestion and enlargement of the liver.—This is so

common a consequence of retardation of the blood on the right side of the heart, that few persons so afflicted in any considerable degree, are exempt from it. This has, I believe, been almost entirely over-looked by authors on the diseases of the heart, and is still very little known. By the obstruction which it occasions in the system of the vena porta, it leads to ascites and jaundice; also eminently favours hæmatemesis, intestinal hemorrhage, piles, and, though indirectly, uterine hemorrhage—many cases of which I have found to be obstinate till the hepatic enlargement was reduced by mercury and aperients. This latter fact has been noticed by Dr. Locock."

"Obstruction in the right auricle, whether from this or any other cause, presents an obstacle to the return of the venous blood, and therefore, causes retardation throughout the whole venous system. Nor is this all; for the retardation is propagated through the capillaries to the arterial system, and thus at length returns in a circle to the heart. In this way is explained what at first sight appears an anomaly; namely, that the left cavities are sometimes rendered *hypertrophic* by an obstruction in the heart situated behind them in the course of the circulation."—Hope on the Heart.

Venous congestion, then, is common to ague, fever, dilatation, and hypertrophy.*

In the preceding extract we have a full-length likeness of the condition of the system in ague, and time and opportunity to study its pathology. We there see that the general

* Although the state of system known as Fever, has ever been considered one of the most complex subjects in Pathology, yet, in reality, when stripped of the phenomena which do not belong to it, as such, it is reduced to a very simple state. Now the phenomena which sometimes attend fever, as flux, hemorrhage, vomiting, black vomit, jaundice, dyspnea, pain, delirium, convulsions, coma, etc., do not belong to fever, as such. They all belong to venous congestion *without* fever, as is demonstrated in dilatation of the heart; and as venous congestion precedes and co-exists *with* fever, we see that none of these attendant phenomena are essential to it. The question, then, is reduced to the single point,—is congestion **or** pressure of blood competent to the production of *increased action*? The answer is in the affirmative, as is demonstrated in hypertrophy; and this would seem to leave no remainder.

symptoms arise from the retrograde pressure of venous blood alone. Re-action or hypertrophy supervening upon ague or dilatation, *tends* to remove congestion or restore the equilibrium of pressure; but failing in this, the increased arterial *vis-a-tergo* co-operates with the antecedent retrograde pressure of venous blood to increase the pressure in the capillaries, thus converting what were before called *passive*, into what are now called *active* diseases or phenomena. This re-action may therefore remove or diminish congestion in some parts and thus remove or diminish some of the antecedent symptoms; and it may increase the pressure in other parts, and thus add new symptoms, or increase those that remain. This corresponds to what is seen in ague and fever. It has been customary, for want of an appreciable general cause for the general symptoms in fever, to refer them to *sympathy*, or *blood poisons*; but in dilatation with hypertrophy we have the opportunity of seeing that venous congestion is *general*, thus corresponding to the general symptoms; and that it is competent to their production, thus furnishing an *appreciable* cause. It does not follow that there should be the same phenomena in every respect, in every case of dilatation with hypertrophy or fever, unless *all* the conditions are the same,—unless there be the same degree and duration of congestion or pressure, since these are *elements* in the production of pathological phenomena; and as *these elements may vary* in different cases, we have an appreciable cause of their Diversity.

Finally, upon the subject of fever.—Flux, hemorrhage, dropsy, and fever, are convertible into each other. Flux, hemorrhage and dropsy, are produced by venous congestion; therefore, fever is produced by venous congestion also. Fever as often results from a suddenly suppressed flux as does dropsy; and is as often relieved by producing a flux, as is dropsy or hemorrhage; and if all cases of fever are not relieved by producing a flux alone, neither are all cases of dropsy. The reason of this is found in the fact that depletion is not the only remedy for congestion; stimulants, tonics, astringents, etc., are also remedies for this state; and, in a certain degree and duration of congestion, are the appropriate remedies. We have seen that the term congestion

is a mark put upon a *relatively increased pressure of blood to the returning pressure of the heart or blood-vessel.* The obvious indication of treatment, then, is either to diminish the pressure of blood, as by depletion, or increase the returning pressure of the vessels, as by stimulants, tonics, astringents, etc., or both. We may be said to do both when we give blue pill to increase secretion and follow it with quinine to increase the returning pressure of the solids;—between the two an equilibrium is established. Depletion in all its forms, whether by abstinence, blood-letting, or increasing secretion, operates by diminishing the pressure of blood; while exercise, bandages, stimulants, tonics, astringents, etc., etc., operate by increasing the returning pressure of the solids. There is a *point of agreement*, then, in the action of stimulants and depletion, upon which point of agreement their efficacy depends. This reconciles the apparent contradictions so often met with in Medical Works, as when one man recommends stimulants, and another, depletion, in a disease of the same name, and with equal success. It depends upon the degree and duration of congestion which class of remedies, are, at first, most appropriate.

The treatment for general and local fever is the same. The symptoms of local fever or inflammation,—heat, redness, pain, and swelling,—are common to general fever, but being diffused over a larger surface, may not be so prominent in every part. The pathological condition, congestion, is the same, and therefore the treatment is the same. There are the same indications for the use of cold, tepid, or evaporating applications to the surface; the same indications for depletion, and the same indications for stimulants, tonics, or astringents.

The treatment for acute and chronic disease is the same in kind though modified in activity by the consideration that in chronic cases the vessels have become *habituated*—from duration of congestion—to a state of over-distension, and cannot return suddenly to their natural calibre upon the sudden removal of pressure. Time is an element in formation and in cure. Hence in chronic disease we deplete more gradually or slowly than in acute attacks.

These principles of treatment are deducible from the premises of this argument, and as they agree with the principles of treatment established by experience, we here have a verification of our Theory.

The experiment of producing general congestion, as seen in dilatation of the heart, is also in verification of the proposition that all pathological phenomena are produced by pressure. We there see the connection which subsists between them,—the *relation* which pathological phenomena bear to each other.

The state marked by the term congestion, as it is the first and easiest produced, must be the most *simple*, and, therefore, the most *general*. Consequently it may exist separately from all other pathological phenomena, while all others must be compounded of congestion, degree and duration, being elements in their production. It follows—

1. That all exciting causes of disease agree in producing the state marked by the term congestion.
2. That this state precedes and co-exists with all pathological phenomena more complex than itself.
3. That the treatment of congestion should illustrate the treatment of all special diseases.
4. That congestion should be a constant *post mortem* appearance whether there be recognised organic change or not."

The two first points we have now seen unequivocally established. The 3d, we have touched upon, but will see exhausted at the hands of another.

3. That the treatment of congestion should illustrate the treatment of all special diseases.

"REMEDIES FOR CONGESTION."

"The most important means in the removal of congestions are those which contribute to the removal of their causes.

Thus the loosing of a ligature or the reduction of a tumour, compressing veins ; the moderating the inordinate and inefficient action of a diseased heart ; the restoration of the secretion of the liver, will severally tend to diminish the congestions resulting from these different causes of venous obstruction.

“ So, also, in the treatment of congestion from atony or weakness of the capillaries, it is important to remove the circumstances which have caused this atony. In many cases it is over-distention from gravitation ; here change of posture gives relief. Thus, in congestive fevers, and other states of continued weakness, it is useful to change from time to time the position of the patient from supine to prone, or lying on either side. With congestion of the head, this part should be supported high. The recumbent posture gives much relief to congested hemorrhoidal or uterine vessels ; as we see it reduce the swelling of varicose limbs.

“ Pressure is sometimes a remedy for congestion, by supporting the weak vessels and promoting their contraction. This forms a chief part of the useful operation of bandages, adhesive plasters, and even of poultices, in various external congestions. It probably might be more extensively applied to these, and even to some internal congestions, in the modes suggested by Dr. Arnott, by mercury, or by the soft slack air-cushion pad.

“ Friction is a modification of pressure especially suitable to some forms of congestion, being calculated to give the motion that is defective, as well as to support the weak vessels. It is obviously useful in external congestions from cold ; and sometimes in visceral congestions, as those of the liver and abdomen generally. Exercise operates somewhat in the same way.

“ Another class of remedies for congestion comprehends those which promote the contraction of the *dilated* vessels by augmenting their contractility or tone. In this way, astringents and cold operate ; as in the use of solutions of alum, sulphates of zinc or copper, acetates of zinc or lead, and infusion of oak bark, catechu, kino, nutgalls, &c., in various congestions, particularly of the conjunctiva, throat,

rectum, and vagina. The most obvious part of the action of bark, quinine, and arsenic, in the cure of ague, is in their reducing the great visceral congestions, which form their most remarkable, and perhaps their most important, pathological element.

"The utility of astringents in congestion is limited by the fact, visible under the microscope, that they commonly contract the arteries more in proportion than the capillaries and veins, which are most distended. Hence they may still further impair the motion of the blood, and increase the congestion. Re-action, however, sometimes occurs, which converts the operation of the astringent into that of a stimulant, which is another kind of remedy for congestion. The same remark is applicable to cold.

"Stimulants sometimes are remarkably effectual in removing congestions. Thus diluted spirit lotion to a congested conjunctiva, capsicum gargle to a congested throat, a stimulating wash or ointment to a purple sore or surface, will often signally reduce the congestion. Other congestions are removed by exciting the circulation generally; a stimulant draught, or even one of any hot liquid, relieves the pulmonary congestion which has induced a fit of asthma; a congestive headache is sometimes mitigated by similar means. Well-regulated exercise tends to disperse congestions in various parts. Various agents, which specifically excite particular organs or parts, are often useful in removing congestions from them. Thus mercury is, in some cases, a remedy for a congested liver; some diuretics, as digitalis and cantharides, for congested kidneys; squill, benzoin, and other expectorants, for bronchial congestion.

"The influence of stimulants on congestion may be illustrated by the microscope. A solution of capsicum applied to a frog's web, congested after previous irritation, causes an enlargement of the arteries, and an increased flow of blood to and through the congested vessels. This flow restores motion where it was deficient, sweeps away the accumulated blood, and, in some instances, causes the vessels to contract afterwards to their natural size; so that the congestion is completely removed: in that case, the cure is com-

plete. In other instances, however, the stimulants fail to clear the congested vessels; the enlarged arteries pour in more blood; but this, not overcoming the obstruction, increases the hyperæmia, and, as we shall afterwards see, may convert it into inflammation. Thus it appears that stimulants, as well as astringents, although occasionally proving remedies for congestion, sometimes tend to increase it; and this they are most likely to do when the congestion is extensive, or of long continuance, or when its causes are still in operation.

"Under such circumstances, congestion is better relieved by another class of remedies, depletion, and various evacuents. Blood-letting, by puncture or incision in the congested parts, enables the distended vessels to unload themselves, and they may recover their size; and the utility of this expedient is shown in scarifications of congested conjunctiva and tonsils, and leeches to a congested os uteri. But the blood is more usually drawn from the vicinity of the congested part, as by cupping, or leeches on the chest or side for congested lungs or liver; to the sacrum for congested uterus; or leeches to the anus for congested intestines. Or, without actually shedding blood, it may be drawn away from the congested part by derivation; that is, by agents which cause determination of blood or congestion in other parts; as dry cupping, mustard poultices, and other stimulating applications to the surface, and by purgatives and other evacuents from the interior. A still more powerful agency of the class of derivants is that of removing atmospheric pressure from a limb by enclosing it in an air-tight vessel, and partially exhausting the air. This was invented by Dr. Arnott, and has been lately employed by Sir James Murray and several French practitioners.

"These act by inducing determination of blood, or even inflammation in another part, and thereby drawing away blood from the congested parts. Some means, however, may be employed, which prevent or remove congestion by damming up the blood in other parts, and thus inducing a counter-congestion. It has long been practiced with success to stop a fit of ague by applying a tourniquet to the thigh;

and Dr. Buckler of Baltimore, following a popular practice of a similar kind, has called the attention of the profession to the general utility of the remedial measures which he terms *hæmotase*; which consists in the temporary application of ligatures to one or more limbs, which are thereby so much congested, that there is not blood left in the circulation sufficient to supply the congested vessels, and these, relieved of pressure, may contract and expel the accumulated blood. I have employed this plan in several cases in which temporary congestions were produced in the lungs and liver, and sometimes with a very remarkable preventive effect; but it has little influence on congestions which have long been formed, and acts chiefly on the distribution of blood in the larger blood vessels.

"The operation of several of the foregoing agents, in combination or succession, is generally more effectual than that of single ones in the cure of congestions. Thus congestion of the liver may resist the action of mercury, and may even be aggravated by it, until the vascular distention has been partially reduced by local blood-letting or derivants; then the mercury, by increasing the secretion, reduces the remaining congestion. Congestion of the kidneys is augmented rather than diminished by diuretics, which then fail to increase the secretion of the urine, but may only render it more albuminous. But after some relief has been obtained by cupping to the loins, and hydragogue purgatives and diaphoretics, then some diuretics, particularly digitalis and cantharides, cause a freer flow of urine with less albumen. The same point might be further exemplified; but it is unnecessary to multiply instances.

"The cause of congestion being, in many instances, atony of the vessels, it may often be counteracted by circumstances which augment the tone of the vessels, locally or generally. Thus cold, astringent, or, occasionally, stimulant applications, by bracing the fibres and invigorating the circulation in a part, render it less liable to congestion from disease; and general tonic measures operate in a similar way on the whole system. The efficacy of bark and arsenic in preventing, as well as in removing the internal congestions of ague,

probably depends on their power of augmenting the tone of the vessels of these parts, so that they no longer yield to the distensive accumulation of blood within them. A similar virtue seems to be possessed, in some degree, by iodine and its preparations, especially the iodide of potassium; under the use of which the disposition to local congestion is diminished, and those formed are sometimes dispersed, as exemplified by the external use of iodine in lepra and other congestions of the skin, and of iodide of potassium in congestive headache. Mineral acids and other tonics have a like effect in cases of general weakness. The treatment calculated to remove the results of congestion will be considered under the subjects, hemorrhage, flux, dropsy and inflammation."

—Williams' Principles of Medicine.

4. That the state marked by the term congestion, is a constant *post mortem* appearance, whether there be recognised organic change or not.

This last point is *universally admitted*.

This argument started with the proposition that, as the pathological state marked by the term congestion, was the first and easiest produced, it must be the most *simple*, and therefore the most *general*.

From this simple state or primary principle, we deduced the whole immense variety of pathological phenomena.

In Verification of this Deduction, we noticed the exciting causes of congestion, and saw that they embraced the exciting causes of all special diseases.

We passed those special diseases under review, and found that the simple principle with which we started, animated them all.

We Eliminated this simple state through Treatment, and saw that it exhausted the treatment of all special diseases.

Finally, it is admitted that the state marked by the term congestion, is a constant *post mortem* appearance.

This fulfils the requirements of the Deductive Method.

Our argument is ended. Experience Accords with it. Reasoning and Experiment Verify it. We have tested its validity by such Authorities as Whately, Whewell, Herschel, Lewes, Mill and Comte, and cannot see wherein it falls short of Scientific Demonstration. If it be said that it wants the scientific character of *Prevision*, it is replied, that it finds an equivalent, in point of certainty, in our power of modifying circumstances,—in our power of producing pathological phenomena, in accordance with the Theory, and only in accordance with it, whenever we will. *It is the only possible Theory therefore that can accord with all the facts.*

